

May 13, 1958

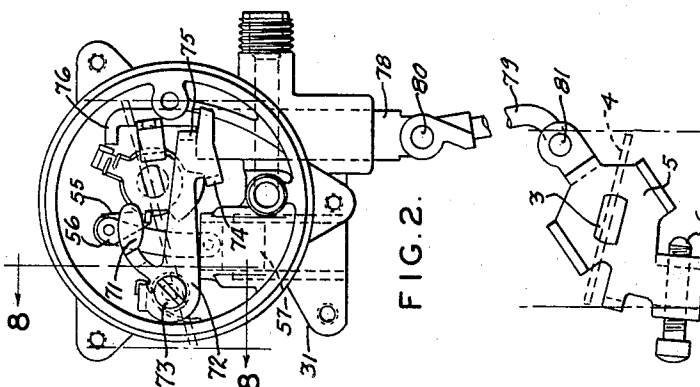
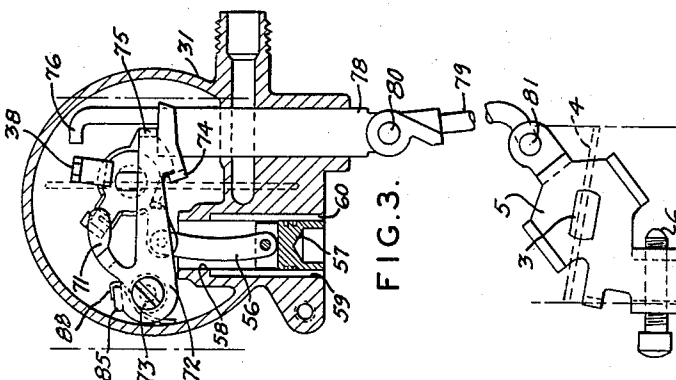
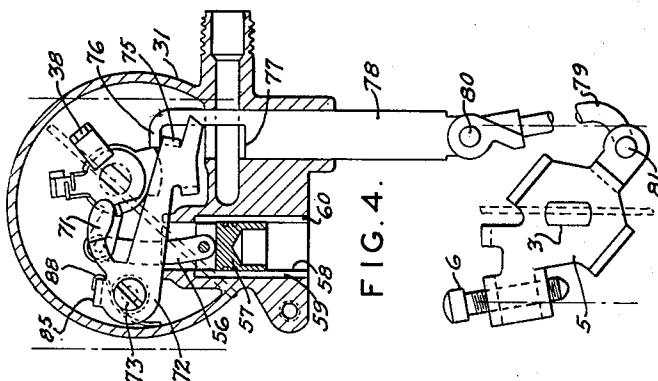
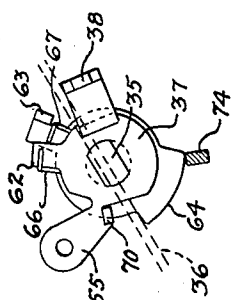
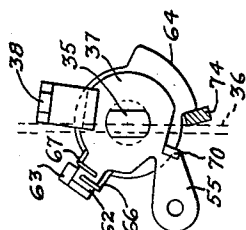
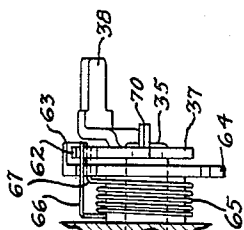
J. L. SZWARGULSKI

2,834,586

AUTOMATIC CHOKE LATCH

Filed Nov. 18, 1954

3 Sheets-Sheet 2



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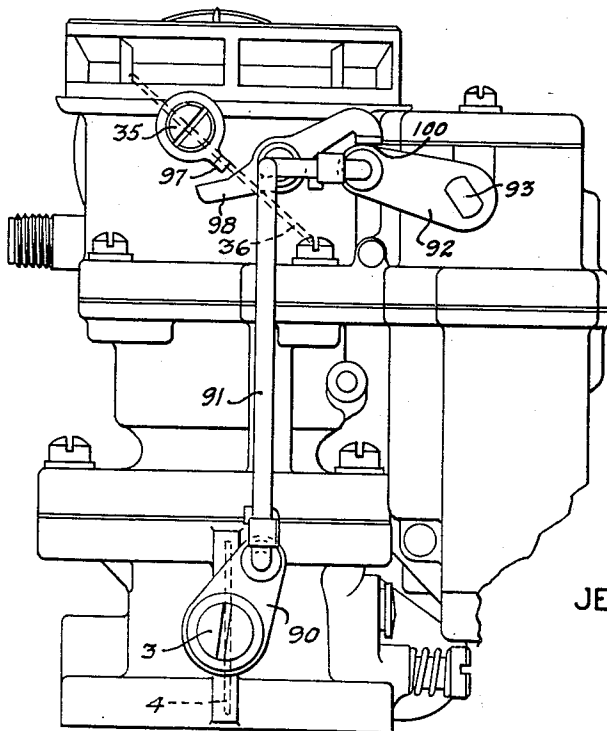
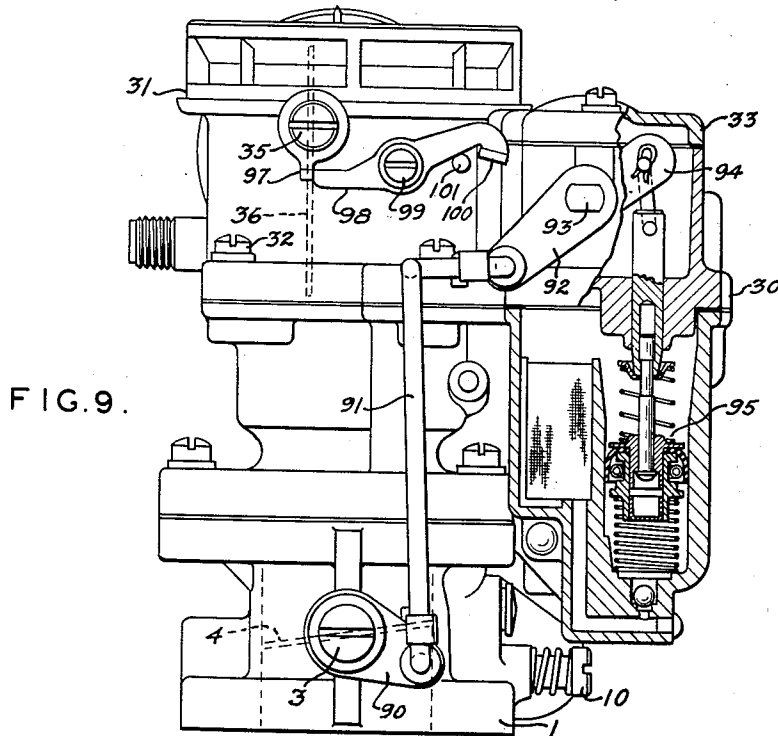
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AUTOMATIC CHOKE LATCH

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Application November 18, 1954, Serial No. 469,583

8 Claims. (Cl. 261—39)

This invention relates to carburetors of the engine-aspirated type provided with an automatic choke or a mixture ratio control responsive to engine temperature. More specifically, this invention is an improvement generally applicable to this type of carburetor by which throttle operation can selectively control the functioning of the automatic choke.

It has been found from experience that in certain applications, or, in some instances, the automatic choke causes difficulty in engine starting and/or operation. These difficulties are not caused by any defect in the equipment, but rather to the inability of the temperature responsive means to reflect true engine temperature.

One instance of these difficulties commonly occurs after short runs in which the engine has reached normal operating temperature and the choke valve has opened fully. Temperatures in the engine compartment of the automobile may be still low, and it has been found that the thermostat of the automatic choke cools much faster than the engine after it has been stopped. This often results in difficulty in restarting after a short stop, because the mixture furnished by the carburetor will then be too rich to be suitable for combustion in the warm engine.

Another instance of these difficulties occurs when the engine is working at heavy load and the under-hood temperature becomes very low, as often happens during cold weather and on long grades at relatively high speeds. Under these conditions, suction in the manifold is insufficient to maintain a sufficient flow of hot air over the temperature responsive means to keep its temperature high enough to prevent some degree of force exerting a pressure tending to close the choke valve. If this happens, the mixture ratio is increased, causing a waste of fuel and uneven and rough engine operation. When operating at high altitudes, such as on steep grades and mountains, this effect is just the opposite to what is regarded as desirable. That is, as the altitude increases, the mixture should be leaner rather than richer.

The object of this invention is to eliminate the effect on engine operation caused by the inability of the thermostat to reflect true engine temperatures, especially in carburetors having the thermostat located remote from the engine and supplied with heat from an engine source by suction in the intake manifold only during operation of the engine.

According to this invention, the automatic choke mechanism of a carburetor is provided with a manually operated latch for retaining the choke valve in wide open position. The latch can be applied to any carburetor having an automatic choke such as shown generally in the prior patent to Coffey 2,325,372 of July 27, 1943, but is described and shown here applied to the automatic choke of carburetors shown in the prior patents to Henne-mann 2,426,272 of August 26, 1947, and Read 2,499,607 of March 7, 1950.

Further objects will appear as this description proceeds.

In the accompanying drawings,

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Fig. 1 is a side view, partly in section, of a carburetor according to the present invention.

Fig. 2 is a view illustrating the parts of the automatic choke mechanism with the throttle closed and omitting the details of the carburetor.

Fig. 3 is an additional view of the parts of the automatic choke mechanism in an alternative condition at closed throttle.

Fig. 4 is another view of the position of the parts of the automatic choke mechanism similar to the previous views, showing the throttle wide open.

Fig. 5 is a detail view similar to Fig. 2 but with the choke in a partially open position and illustrating the position of the fast idle cam.

Fig. 6 is a detail view illustrating the position of the fast idle cam in Fig. 3.

Fig. 7 is a side view of the parts shown in Fig. 6.

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 2.

Fig. 9 is a side view of a carburetor showing a modified form of the invention.

Fig. 10 is a view similar to Fig. 9 showing the parts of the locking mechanism in a different position.

Fig. 11 is a fragmentary view of a carburetor showing a modified form of the invention illustrated in Figs. 9 and 10.

The carburetor shown in Fig. 1 has a throttle body 1 through which extends a mixture conduit 2. Journaled in the throttle body is a throttle shaft 3 mounting throttle valve 4. A throttle control lever 5 is secured to the outer end of the throttle shaft 3 and adjustably mounts the throttle adjustment screw 6 abutting a web 7 on the throttle body.

Adjacent one edge of the throttle 4 are a pair of idle ports 8 and 9, one of which is controlled by an idle adjusting screw 10. An interconnecting passage 11 between the ports extends upwardly in the throttle body for connection with idle tube 12, all in a manner well understood in the art.

Suitably secured to the throttle body by cap screws 15, or the like, is a nozzle body which contains primary, secondary, and main venturis 17, 18 and 19, respectively. Formed integrally with the nozzle body of the carburetor is a float bowl 20, which contains the usual float 21 for controlling the needle valve in the fuel supply to the float bowl. Within the float bowl 20 is a metering jet 22 controlled by a stepped metering pin 23 which may be connected for operation by the throttle. Fuel jet 22 controls the flow of fuel into a passage 24 which, in turn, connects with a main fuel passage 25 extending to the main fuel nozzle 26. A suitable metered orifice 28 controls the air bleed passage extending into the main fuel passage 25.

Float bowl 20 is closed by a cover 30 formed integrally with the air horn 31 and secured in place by suitable cap screws 32. Cover 30 may also include a dust cap 33 for enclosing a countershaft operated by a throttle and, in turn, connected to an accelerating pump and metering rods, all as shown in Fig. 9. Since these parts are not part of the present invention, they are not described in detail.

Air horn 31 rotatably supports an eccentrically arranged choke valve shaft 35, upon which is eccentrically mounted an unbalanced choke valve 36, as shown in Fig. 9.

In Fig. 1 a finger 38 on an arm secured to the choke shaft projects through a slot 39 in a plate 40. Screw 54 secures plate 40 in position. A bimetallic spring thermostat 41 has a finger 42 arranged to engage the finger 38 when the temperature is low, and to expand and move away from the finger 38 as the temperature increases. The opposite end of the thermostat 41, indicated as 43,

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is fixed in a slot of boss 44 protruding inwardly from a cap or housing 45, which may be adjustably held in place on the air horn by a series of cap screws 49 engaging clamping elements 50.

Within the housing 45 is a warm air inlet 51 which communicates with a connection 52 threaded at 53 for connection with a tube extending from the usual stove on the exhaust manifold.

Figs. 2 to 7 best illustrate the choke mechanism concealed behind the plate 40.

Rigidly mounted on the choke shaft 35 is a plate 37 which carries the finger 38 above described. Radially extending from the plate 37 is an apertured lever 55 which is connected, in turn, to a link 56 extending to piston 57 in cylinder 58. Formed in the walls of the cylinder are by-pass passages 59 and 60.

It will be understood that the cylinder 58 is formed integrally with the air horn 31 and is, in turn, connected by a registering passage in the nozzle body and throttle body of the carburetor 1 to a source of suction posterior of the throttle 4.

Plate 37 carries a radially protruding finger 62 which is adapted to register with a lug 63 on a fast idle cam 64 freely rotatable on choke shaft 35. Finger 62 and lug 63 are interconnected by a torsion spring 65 shown in Fig. 7, which has fingers 66 and 67 engaging opposite sides of the finger 62 and lug 63, respectively, so as to resiliently urge the fast idle cam 64 in a counter-clockwise direction as the choke valve 36 opens.

Plate 37 also carries a forward extending finger 70 adapted to underlie an inwardly offset cam 71 formed integral with an arm extending from lever 72 hinged about a pin 73.

On the lever 72 is an inwardly extending lug 74 lying in the path of rotation of the fast idle cam 64. Outwardly spaced from the finger 74 is a similar finger 75 within the path of movement of hook 76 and shoulder 77 of plunger 78.

The plunger 78 is operated from the throttle control lever 5 by a link 79 pivotally connected with the plunger 78 at 80 and with the lever 5 on the throttle shaft at 81.

The structure above described corresponds generally with that disclosed in the patents to Read and Henne-mann, above mentioned.

The objects of the present invention can be attained by a simple modification of the above described structure, readily understood with reference to Figs. 2 to 8, inclusive. The afore-described lever 72 on hinge pin 73 has a spaced bracket 85 integral therewith which is apertured to receive the boss 86 supporting the hinge pin 73. A torsion spring 88 surrounds the boss 86 and has its opposite extending ends engaging the arm 85 and the inner wall of casing 89 forming the housing for the choke mechanism. The lug 63 is also provided on the fast idle cam plate 64.

Operation

The above described mechanism will operate in response to throttle movement in the following manner. With the engine at rest, and the throttle closed, the parts will assume the relationship shown in Fig. 3. Plunger 78 will be in a raised position with shoulder 77 abutting the inturnd lug 75 to hold the lever 72 in raised position. With the lever 72 raised, the lug 74 is positioned in front of the fast idle cam 64 which is, in turn, freely rotatable on the choke shaft 35. The action of these parts is best shown in Fig. 6. So long as the lug 74 engages the front edge of the fast idle cam, the lug 63 on the fast idle cam will form a fixed abutment opposing any clockwise rotation of the plate 37 which is, in turn, fixed to the choke shaft and rotatable therewith. Thus, the choke valve can open in response to engine suction but cannot close if open, and the choke valve will be held in wide open position so long as the lug 74 remains in front of the fast idle cam 64, as shown in Fig. 6.

As the throttle is opened, plunger 78 will be moved

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downwardly until finger 76 engages lug 75. This action will free lug 74 from in front of the fast idle cam 64, allowing the choke valve to close.

During the last 10 or 15 degrees of opening movement of the throttle valve, arm 72 will rotate cam 71 until it contacts with lug 70 on plate 37. This last few degrees of throttle opening will provide for unloading by opening the choke valve to the position shown in Fig. 4.

Return movement of the throttle valve to a partially closed position allows the choke valve to close by releasing the pressure between cam 71 and lug 70. When these surfaces disengage, the choke valve 36 will be in the fully closed position. In this position of the choke valve, lug 63 will be rotated to the clockwise position shown in Fig. 5, where it no longer abuts against the projection 62 on plate 37, and fast idle cam 64 is urged by spring 65 to rotate to the position shown in Fig. 5, where it forms an abutment on its cam surface for the lug 74. With arm 72 slightly lower because of the engagement between the face of the cam 64 and the lug 74, plunger 78 will be slightly depressed because of the abutting relation between the lug 75 and the shoulder 77. This arrangement provides the fast idle positions for the throttle valve.

During operation of the engine, the normal increase in temperature of the thermostat 41 will gradually release the tension exerted by the finger 42 on the lug 38. Suction acting upon the choke valve or piston 57, or both, will gradually open the choke valve as the tension in the thermostat decreases. During rotation of the choke valve toward the open position, torsion spring 65 will continually urge the fast idle cam 64 counter-clockwise. When normal engine temperature is reached, the cam 64 will have rotated to the position shown in Fig. 3, usually after the throttle is opened releasing the drag between lug 74 and the face of cam 64. This position of cam 64 allows the lug 74 to raise in front of the cam 64, locking the choke valve open, and permits the throttle to close to dead idle position.

As will be seen from Figs. 3 and 8, arm 72 will be held in its raised position by spring 88, independent of any support from plunger 78. In this raised position of the arm 72, lug 74 forms a definite stop against movement of the choke valve to closed position.

Except for the function of the locking feature above described, the function of the automatic choke mechanism is exactly as has been described in the prior patents. The simple addition thereto of the lug 63 and the spring 88 provides the additional function not present in the prior apparatus.

This structure provides a sequence of operations to the choke valve wherein operation of the throttle toward open position first unlocks the choke valve, allowing it to close under the influence of the temperature responsive means, and then opens the choke valve partially by the unloader. On throttle closing, the choke valve is allowed to close, since it will remain unlatched.

The sequence of control of the choke valve 36 provided is suitable for all conditions which can exist during engine starting or restarting.

If we presume in each instance that the engine has reached a normal temperature before being stopped, then the choke valve 36 will be in the latched, wide-open position as shown in Fig. 3. When engine temperature and ambient temperatures are low, the throttle may be gradually opened during engine cranking, which will result in a prompt start for the engine, since, as the throttle is gradually opened and then closed to the cold starting position, the choke valve will be unlatched and allowed to respond to the influence of the temperature responsive means to provide a suitable rich mixture for starting.

When the engine temperature is low but ambient temperatures relatively high, the same starting procedure will provide for a fast start. In this case, as the engine is cranked and the throttle opened wide and then returned

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to the best cold start position, the choke will be first closed when unlatched, and at the same time the accelerating pump will furnish additional gasoline, which should be sufficient to provide for the start. However, since all engines differ, if the engine requires more gasoline for a start, the return movement of the throttle to the best cold position will allow the choke valve to take over and provide that extra richness in mixture that is necessary.

When ambient temperatures are high, of course, the engine will not cool down below those temperatures, although it may be below normal operating temperature. In this case, the engine may require very little increase in mixture richness in order to start, or none at all. If we presume that the ambient temperature is 75 degrees, or approximately in that range, the temperature responsive means will be active, tending to close the choke valve. The latch will, however, retain the choke valve in wide open position against the pressure of the thermostat. Under these conditions, the same starting procedure would be applicable. As the engine is cranked, the throttle is gradually opened and normally, under this condition, the engine should start before the latch is disengaged. However, if some slight enrichment is necessary, this will be provided as soon as the throttle opens to the position disengaging the latch. Then the choke valve will close temporarily under the influence of the temperature responsive means, usually sufficient to give the slight enrichment necessary to the mixture to produce the start. The action of the choke valve is similar to that of giving a manual choke one quick pull and then opening the same, and the result is equally beneficial.

When the engine is hot and the ambient air temperatures are above 75 degrees, of course, the choke valve will not be closed under any circumstances, and operation of the accelerator during cranking to the position best for hot starts should produce the prompt starting of the engine.

None of the necessary standard features of the automatic choke mechanism are affected by the application of this latch mechanism. The same advantages are retained, and the mechanism merely provides for a single operating procedure to produce starting or restarting of the engine under all conditions.

In addition to the above enumerated advantages, the latch mechanism above described will also be effective on long, hard pulls when the engine is operating at near full throttle. Under these conditions, suction operating on the valve 36 and on the piston 57 sometimes is not sufficient to hold the choke open. In addition, the amount of heated air supplied to the temperature responsive means depends upon the amount of suction in the intake manifold. This flow may diminish to the point, during cold weather especially, where the temperature responsive means tends to return the choke valve or exert a pressure to close the choke valve. Enrichment of the mixture by the choke valve is not desirable, and will be prevented by the latch mechanism of this invention.

In Figs. 9 and 10, a modification of the invention is shown in which the latch may be arranged to operate to maintain the choke valve wide open when the throttle is closed, and at the same time it can be designed to operate to unlatch the choke valve on any part of the opening movement of the throttle. In this modification the latch mechanism is not incorporated in the automatic choke, but is completely separate therefrom and capable of independent operation by the throttle.

Fig. 9 shows the opposite side of the carburetor illustrated in Fig. 1. Throttle body 1 rotatably mounts throttle shaft 3 supporting the throttle 4. On this end of the throttle shaft 3 is an arm 90 connected by an intermediate link 91 with countershaft operating arm 92 fixed to the countershaft 93. Connected to be operated from the countershaft 93 is a rocker arm 94 in turn connected to the accelerating pump mechanism generally indicated as 95.

Choke shaft 35, which projects through the side of the

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carburetor, has a circular washer fixed thereto carrying a latching dog 97 positioned to be engaged by latch 98 pivoted about the pin 99 mounted in the side of the air horn. Bearing surface 100 on the opposite end of the latch 98 is positioned to be engaged by countershaft arm 92 during throttle opening movement and is held in position as shown in Fig. 9 by a stop member 101.

Operation

As shown in Fig. 10, as the throttle 4 is opened, arms 90 and 92 rotate actuating the accelerating pump and, during their movement, engage with the bearing pad 100 for releasing the latch 98 from the dog 97. The construction of the parts is susceptible to change, so that the unlatching operation can be timed to occur any time within the throttle opening action. For instance, the parts can be so designed that the unlatching will occur before, simultaneously with, or slightly after the engagement of the cam 71 with lug 70, which determines the beginning of the unloading cycle.

Fig. 11 shows another modification of the invention wherein the latch member for locking the choke in the wide-open position is separate from the automatic choke control mechanism previously described as in Fig. 9. In Fig. 11 a latch member 110 similar in construction to 98 in Figs. 9 and 10 is shown pivotally mounted on a stud 99. A Bowden wire, or the like, 111 extends from the instrument panel of the car and has a lost motion connection by way of slot 112 with a depending arm 113 on the latch.

Concentrically mounted with respect to the latch 110 on the same stud 99 is a second latch member 115 positioned to engage the dog 97 on the choke shaft 35. Latch member 115 has an actuating arm 116 to which the Bowden wire 111 is rigidly attached. As will be obvious from Fig. 11, the Bowden wire extends through the slot 112 to its point of attachment with the arm 116.

In this modification, the Bowden wire 111 is shown in the intermediate position, in which position the latch 115 may be engaged with the dog 97. If, however, the latch 115 is disengaged, then during engine warm-up, as the choke valve opens, the dog 97 rides on the upper surface of the automatic latch 110, tilting it downwardly in a counter-clockwise direction until the choke valve reaches wide open position. At this point in the operation, the weight of the opposite end of the latch 110 tilts the latch in a clockwise direction so as to bring the latch finger 110 into abutting relation with the dog 97, thus locking the choke valve in the open position. Latch 110 can be released by opening movement of the throttle, which will rotate the countershaft arm 92 in a clockwise direction until it engages the pad 100 of the latch 110 and rotates the latch in a counter-clockwise direction to disengage the latch from the dog 97. Alternatively, latch 110 may be released manually at any time by pulling on the Bowden wire 111.

On extremely long grades at low ambient temperatures, the choke valve may be manually locked in a positive fashion into an open position by pushing on the wire 111, which will rotate the latch 115 into abutting engagement with the lug 97 to maintain the choke valve in the wide-open position regardless of throttle opening. Although latch 110 may be disengaged by wide-open throttle operation of the engine, latch 115 will maintain the choke valve latched in the open condition. This feature of operation may be important under unusual conditions such as those which require full throttle opening for full engine power for extended periods at low temperatures.

This arrangement of the parts provides for many different starting positions besides those which are characteristically carried out by the automatic choke mechanism. With this arrangement, the automatic choke may be released by operation of the Bowden wire 111 on the instrument panel of the vehicle before the starter is engaged

and the engine cranked. This will allow the automatic choke to operate in the normal manner. On the other hand, the engine may be cranked, and, if it does not start, the manual operator 111 may then be actuated to release the latch.

The manner in which this latch has been combined with the automatic choke mechanism provides for the manufacturer to adapt the carburetor so that a standard operating procedure can be followed or recommended for starting the particular automobile, which will operate regardless of ambient or engine temperatures. On the other hand, this mechanism can be operated manually, either by the throttle or by hand, provided the operator becomes familiar enough with the starting characteristics of the particular automobile.

With a cold engine and at lower ambient temperatures, it is obvious that some choking will be necessary. Also, it is beneficial if the accelerator pump is operated. Consequently, an operator of the automobile familiar with the particular conditions will open the throttle first before cranking the engine, so as to unlatch the automatic choke and supply an added shot of gasoline from the accelerating pump, all of which will be beneficial for starting under the particular circumstances.

On the other hand, under different temperature conditions of the engine and surrounding atmosphere, an operator familiar with the starting characteristics of the particular engine may find that the best starting is obtained by a different manipulation of the throttle or the manual control, in which case the automatic choke control may be held latched in the open position while the throttle is opened to the particular point which experience dictates produces the quickest and easiest starting.

Obviously, the mechanism is capable of producing the right mixture by a simple manual operation of the throttle to suit any particular conditions.

A structure has been described which will fulfill all of the objects as set forth, but it is contemplated that other modifications coming within the scope of the appended claims may readily occur to those skilled in the art.

I claim:

1. In a carburetor, the combination of a choke valve and a throttle for controlling the flow of fuel from said carburetor, a manifold suction operated mixture ratio control means including a temperature responsive means to actuate said valve, latch means for rendering said mixture ratio control inoperative when said valve is in its full open position, and means to release said latch responsive to full opening of said throttle to restore control of the fuel mixture ratio to said suction operated means and said temperature responsive means.

2. In a carburetor, the combination of a choke valve and a manually operated throttle for controlling the flow of fuel from said carburetor, a manifold suction device for actuating said valve gearing between said throttle and said device including latch means for maintaining said valve in open position to render said device inoperative through a substantial range of throttle positions.

3. In a carburetor, the combination of a throttle for controlling the discharge of fuel mixture from said carburetor, a choke valve for said carburetor, a first means for controlling said choke valve according to engine temperature and manifold suction, a second means for controlling the range of movement of said throttle, a one-way positive connection between said second means and said choke valve, and a stop engaging said second means as said choke valve opens to prevent closing of said choke valve through said connection.

4. In an automatic choke mechanism for a carburetor comprising an air horn mounting a pressure responsive

valve, a first means for controlling said valve including temperature and manifold suction responsive devices, and a second means for controlling said valve operated by a manual control for said carburetor, the combination of a first latch positioned to be released by operation of said manual control for retaining said choke valve open, a latch operator having a lost motion connection with said latch, a second latch for retaining said choke valve open, and a positive connection between said latch operator and said second latch.

5. In a carburetor, the combination of a throttle for controlling the discharge of fuel mixture from said carburetor, a choke valve for said carburetor, a first means for controlling said choke valve according to engine temperature and manifold suction, a second means for controlling said first means within the initial range of movement of said throttle comprising a throttle linkage and a member movable with the choke valve for controlling the position of said throttle linkage at low engine temperatures, a positive connection between said member and said choke valve, and a stop having a lost motion connection with said throttle linkage and movable in a direction to lock with said member after said choke valve has opened to prevent closing of said choke valve within the range of throttle positions permitted by said lost motion connection.

6. In a carburetor, the combination of a throttle for controlling the discharge of fuel mixture from said carburetor, a choke valve for said carburetor, a first means for controlling said choke valve according to engine temperature and manifold suction, a second means for controlling the operation of said first means within the initial range of opening movement of said throttle comprising a fast idle cam, a one-way positive connection between said fast idle cam and said choke valve for positively operating said cam in response to opening movement of said choke valve, a throttle mechanism for said carburetor, a pivoted lever spring-biased in one direction and having a lost-motion connection with said throttle mechanism, and a stop on said lever positioned to engage and lock said fast idle cam against movement within the initial range of throttle positions permitted by said lost motion connection after said choke valve has moved to fully open position.

7. In a carburetor, a choke valve, valve control means operable responsive to engine temperature and manifold suction to move said valve between its open and closed positions, a latch to lock said valve in its open position, a throttle operatively connected to said valve for unloading, and means operative responsive to movement of said throttle to its unloading position to release said latch to return control of said valve to said valve control means.

8. In a carburetor, a throttle, a choke valve, valve control means operable responsive to engine temperature and manifold suction to move said valve between its open and closed positions, a latch to lock said valve in its open position throughout a substantial range of throttle positions, and manually operable means including a throttle for releasing said latch to return control of said valve to said valve control means.

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